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BY: Suzanne Shadley
Suzanne Shadley

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Diamond et al.		
Serial No.:	09/596,851	Group Art Unit:	1627
Filed:	June 19, 2000		
For:	High Throughput Screen For Identifying Polymerization Catalyst From Potential Catalysts	Examiner:	M. Garcia Baker

#23
5/20/03
5-6-03

Santa Clara, California
April 30, 2003

Assistant Commissioner for Patents and Trademarks
Washington, D.C. 20231

DECLARATION OF VINCENT J. MURPHY

UNDER 37 C.F.R. §1.132

I, VINCENT J. MURPHY, hereby declare as follows:

1. I am the Director of the Homogeneous Catalysis Group at Symyx Technologies, Inc., 3100 Central Expressway, Santa Clara, CA 95051. I own Symyx common stock and receive stock options as part of my compensation at Symyx. I make this declaration in support of Applicants' response to the issues raised by the Office.

2. I graduated from Oxford University in the United Kingdom with a Doctor of Philosophy in 1993 and from the University of Manchester, Institute of Science and Technology in the United Kingdom with a Bachelor of Science in Chemistry in 1990. I worked as a post-doctorate researcher at Columbia University in New York, New York from 1994-1996, and at Exxon Chemical Company in Baytown, Texas from 1996-1997. I have authored or co-authored over 35 publications, many of which are related to olefin polymerization. Examples include: T. R. Boussie et al., "The First Fully-Integrated High-Throughput Screening Methodologies for the Discovery of New Polyolefin Catalysts: The Discovery of a New Class of High Temperature Single-Site Group (IV) Copolymerization Catalysts", 125 *J. Am. Chem. Soc.* 4306 – 4317 n.14 (2003); V. Murphy et al., "High-throughput approaches for the discovery and optimization of new olefin polymerization catalysts", 2 *Chemical Record* 278-289 n.4 (2002); U.S. Patent 6,030,917, to Weinberg et al., issued February 9, 2000, and entitled "Combinatorial synthesis and analysis of organometallic compounds and olefin polymerization catalysts"; and. U.S. Patent 6,248,540 to Weinberg et al., issued June 19, 2001, and entitled "Combinatorial synthesis and analysis of organometallic compounds and homogeneous catalysts". My CV is attached hereto as Exhibit A. I joined Symyx in 1997.

3. I have reviewed the May 21, 2002 Office action, the September 23, 2002 Applicants' reply to the action, the December 31, 2002 Final Office action, the pending claims and the specification in the above-identified patent application. I have also reviewed PCT application numbers WO 97/42232 to Van Tol et al. and WO 97/32208 to Willson. I helped to draft and have reviewed the presentation (attached to this Declaration as Exhibit B) by Dr. James C. Stevens of The Dow Chemical Company. I have also reviewed the various attachments to this Declaration.

4. I understand that the claims in this patent application (*e.g.,* claims 16 and 42, together with claims depending therefrom) are directed to methods for screening potential catalysts for polymerization performance for at least a second monomer, using a first monomer (sometimes referred to as a "probe monomer"). As I read the claims, each

of the methods requires concurrently reacting an array of at least 8 potential polymerization catalysts with a first monomer under polymerization conditions and then using the results of those reactions as a figure of merit for planning of additional screens, laboratory or commercial polymerizations or copolymerizations. More specifically, each of the claims requires at least (i) reacting at least 8 potential polymerization catalysts with a first monomer, (ii) evaluating the results of the polymerization reactions, and (ii) using those results as a figure of merit for predicting the behavior of those same catalysts with a second monomer.

5. In my opinion, the phrases "using the polymerization performance as a figure of merit for planning" and "using the determination as a figure of merit for planning" as recited in claims 16 and 42, respectively, are not confusing. I understand these phrases to mean that the results of the polymerization reactions (e.g., polymerization performance of the catalyst or a property of the polymer sample) have to overcome a certain threshold before they will be selected for additional experimentation. The figure of merit is the value associated with the particular property being measured for comparison to a threshold performance. The threshold performance is determined by the experiment designer and is typically set sufficiently high so that many catalysts do not meet that performance (thus screening the catalysts, i.e., rejecting some and proceeding with others). In the invention being claimed in this application, the performance threshold is set high enough that a prediction can be made about the catalyst when the performance of the catalyst exceeds the threshold.

6. From my experience, a typical catalyst research program includes synthesizing a single compound, isolating the compound, characterizing it and finally, checking the performance in a polymerization reaction. In my opinion, this is the approach that is described in the Van Tol reference. In contrast, the claims of the invention describe a method that rapidly screens catalysts for performance, allowing the steps of isolating and characterizing to either be skipped altogether, or conducted at a later time when it has been determined that the catalyst has potential commercial value. This results in a

dramatic increase in both the number of catalysts that can be evaluated, and the chances of success of finding a new, important catalyst family.

7. As I read the reference, Van Tol is directed towards a well-known olefin polymerization process. Van Tol describes the process of polymerizing olefins using reduced group 4 metal catalysts. Van Tol does not screen arrays of catalysts or provide methods for identifying superior catalysts from libraries. Furthermore, Van Tol does not predict the polymerization performance of a catalyst for a second monomer based on the performance of that catalyst with a first monomer. The Van Tol reference instead checks that three different catalysts have utility for polymerizing three different monomers. It is my opinion that Van Tol does not teach how to predict the polymerization performance of a catalyst for a second monomer based on the performance of that catalyst with a first monomer, because there is no consistent use of a single catalyst and there is no figure of merit having a threshold value to be met, thereby allowing for the prediction to be made.

8. I have reviewed the presentation (attached to this paper as Exhibit B) by Dr. James C. Stevens of The Dow Chemical Company, which compares the present invention to techniques of the past showing that the present invention in part has assisted in the discovery of a new class of catalysts for olefin polymerization. The invention as part of the presentation discloses a powerful parallel primary screen that provides data that can be used as a predictor for the selection of catalyst systems from an array of metal-ligand-activator combinations that have a higher probability of possessing a commercially relevant set of catalytic performance characteristics, for example high activity, high co-monomer incorporation, high molecular weight and single-site behavior. The method, as shown on page 18 of the presentation, describes a primary screen that is run on 1-octene to predict the polymerization potential for catalysts for the copolymerization of ethylene-1-octene. Pages 25 and 26 of Exhibit B show the design of the primary screen in which 24 selected metal-ligand combinations at a selected concentration, are each activated using eight different activation conditions, and assessed for their ability to catalyze the polymerization of 1-octene. Page 26

shows the polymerization results of the catalyst libraries. In this instance, % conversion of 1-octene monomer to poly-1-octene is the figure of merit, which is used to design further polymerizations involving another monomer. Pages 28-30 show the design of further polymerizations based around one of the catalysts that surpassed the figure of merit set in the primary screen. Thus, the performance of arrays of catalysts to polymerize one "easy to screen probe monomer" (1-octene) is used in a screen to predict the properties of that same array of catalysts for the "more difficult to carry-out" co-polymerization of the "probe" monomer with other co-monomers (ethylene-1-octene). The catalysts that had a high enough figure of merit are selected for the subsequent secondary screen of copolymerizing ethylene and 1-octene at high temperatures. Page 30 shows the secondary polymerization procedure. Page 31 and 32 display the results of the secondary polymerization with the conclusion on page 33 that a new hafnium catalyst was discovered using the method. The presentation concludes that the results from the primary screen were effectively used to select and develop a novel catalyst family through further structural elaboration and secondary screening. This was accomplished using parallel polymerization reactor technology, and rapid polymer characterization techniques. In addition, a paper was recently published that also describes some of this methodology, which is attached hereto as Exhibit C (125 *J. Am. Chem. Soc.* 4306 – 4317 (2003)).

9. By many different measures the screening methods claimed in this application for using the polymerization of a first monomer as a predictor for the performance of the same catalyst for polymerization of a second monomer (including the inventions defined by claims 16 and 42, together with claims depending therefrom) have been a commercial success. This screening process described in the application has discovered important new catalyst systems, such as described in Exhibit C as recognized in the news report in Exhibit D. Also, WO02/38628 describes pyridyl amine catalysts that potentially have commercial value, where a primary screen with octene was used to develop an ethylene-propylene catalyst. The claimed invention has potential for broad applications in homogeneous catalyst research programs. Symyx has successfully implemented a collaborative research program involving the

execution of the claimed methods for screening potential catalysts using the predictive model as claimed with The Dow Chemical Company. Dow has paid over twenty million U.S. dollars ($20,000,000) over a period of 4 years for this collaborative research program, and part of what they paid for and continue to pay for are the methods encompassed by these claims. *See* "Dow Chemical and Symyx Sign Polyolefin Collaboration", Symyx News Release dated March 9, 1999, and "Symyx Technologies and Dow Extend Research Collaboration", Symyx News Release dated June 12, 2002, copies of which are attached hereto as Exhibit E. This collaboration has met with positive results. *See* "Dow and Symyx Announce Discovery of New Class of Polyolefin Catalyst", Symyx News Release dated March 31, 2003, a copy of which is attached hereto as Exhibit F.

10. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that the statements herein were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and that such willful false statements may jeopardize the validity of the above-identified application or any patents issuing thereon.

Date: April 30th, 2003

Vincent J. Murphy